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(54) [Title of the Invention]  
METHOD FOR GENERATING ULTRAVIOLET LIGHT AND ULTRAVIOLET  
LIGHT SOURCE APPARATUS

(57) [Abstract]  
[Object]

The present invention is aimed mainly at providing an ultraviolet light

source providing a continuous spectrum in the ultraviolet range.

[Solution]

A method for generating ultraviolet light, the method including: collecting and applying pulsed laser light to an inert gas packed in a gas cell so as to generate laser plasma; and directing ultraviolet light generated from the plasma to the outside of the gas cell through an ultraviolet light transmissive window. An ultraviolet light source apparatus comprising: a gas cell for packing an inert gas therein; an inert gas introduction section; a mechanism that collects and applies pulsed laser light to the inert gas within the gas cell; and a window that directs ultraviolet light generated within the gas cell to the outside of the gas cell.

[Selected Drawing]

Fig. 1

[Claims]

1. A method for generating ultraviolet light, the method comprising: collecting and applying pulsed laser light to an inert gas packed in a gas cell so as to generate plasma; and directing ultraviolet light generated from the plasma to the outside of the gas cell through an ultraviolet light transmissive window.
2. The method for generating ultraviolet light according to claim 1, wherein the inert gas packed in the gas cell is a noble gas, or a gas including a noble gas as a major component thereof.
3. The method for generating ultraviolet light according to claim 2, wherein the inert gas packed in the gas cell is krypton (Kr).
4. The method for generating ultraviolet light according to any of claims 1 to 3, wherein the pulsed laser light is YAG laser light.
5. The method for generating ultraviolet light according to any of claims 1 to 4, wherein particulates also exist within the inert gas packed in the gas cell.
6. An ultraviolet light source apparatus comprising: a gas cell for packing an inert gas therein; an inert gas introduction section; a mechanism that collects and applies pulsed laser light to the inert gas within the gas cell; and a window that directs ultraviolet light generated within the gas cell to the outside of the gas

cell.

[Detailed Description of the Invention]

[Technical Field]

[0001]

The present invention relates to a method for generating ultraviolet light and an ultraviolet light source apparatus.

[Background Art]

[0002]

Conventionally, excimer light sources, deuterium lamps, low-pressure mercury lamps and the like have been used as light sources for ultraviolet light. Such ultraviolet light sources exhibit high energy intensity at a specific wavelength and are useful as, for example, germicidal lamps. However, these ultraviolet light sources have a non-uniform broadband spectrum and, due to such properties, they cannot be regarded as a desirable light source for an apparatus that requires a broadband spectrum, e.g., a light source for a spectrophotometer in the ultraviolet wavelength range (see Non-Patent Document 1).

[Non-Patent Document 1]

“Spectroscopy Handbook” (Asakura Publishing Co., Ltd.) edited by Shigeo Minami and Yoichi Goshi

[Disclosure of the Invention]

[Problems to be Solved by the Invention]

[0003]

In view of the above, a main object of the present invention is to provide an ultraviolet light source which exhibits a continuous spectrum in the ultraviolet range.

[Means for Solving the Problems]

[0004]

In order to achieve the above object, the present inventors conducted intensive studies and, as a result, have found that the above object can be achieved by collecting and applying pulsed laser light to an inert gas packed in a gas cell so as to generate laser plasma and by directing ultraviolet light generated from the plasma to the outside of the gas cell.

[0005]

Specifically, the present invention provides a method for generating ultraviolet light and an ultraviolet light source apparatus as set out below.

1. A method for generating ultraviolet light, the method comprising: collecting and applying pulsed laser light to an inert gas packed in a gas cell so as to generate plasma; and directing ultraviolet light generated from the plasma to the outside of the gas cell through an ultraviolet light transmissive window.
2. The method for generating ultraviolet light according to item 1 above, wherein the inert gas packed in the gas cell is a noble gas, or a gas including a noble gas as a major component thereof.
3. The method for generating ultraviolet light according to item 2 above, wherein the inert gas packed in the gas cell is krypton (Kr).
4. The method for generating ultraviolet light according to any of items 1 to 3 above, wherein the pulsed laser light is YAG laser light.
5. The method for generating ultraviolet light according to any of items 1 to 4 above, wherein particulates also exist within the inert gas packed in the gas cell.
6. An ultraviolet light source apparatus comprising: a gas cell for packing an inert gas therein; an inert gas introduction section; a mechanism that collects and applies pulsed laser light to the inert gas within the gas cell; and a window that directs ultraviolet light generated within the gas cell to the outside of the gas cell.

[Effect of the Invention]

[0006]

According to the present invention, it is possible to generate ultraviolet light having a continuous spectrum in the ultraviolet range.

[0007]

Therefore, the ultraviolet light source apparatus according to the present invention has advantageous effects, particularly as a light source of a spectrophotometer in the ultraviolet range.

[0008]

In addition, the ultraviolet light source apparatus according to the present invention is also useful as a mercury-free germicidal device.

[Best Mode for Carrying out the Invention]

[0009]

Now, the present invention will be described more specifically, with reference to a cross-sectional diagram showing the outline of an embodiment of the present invention.

[0010]

Fig. 1 is a schematic cross-sectional view showing the outline of an ultraviolet light source apparatus according to the present invention.

[0011]

When generating ultraviolet light using the apparatus of the present invention, an inert gas is packed in a gas cell and, in that state, pulsed laser light from a pulsed laser system is introduced into the inert gas through a condenser lens, so as to generate laser plasma. The laser plasma thus obtained shows a broadband spectral distribution from the ultraviolet range to the infrared range. Accordingly, ultraviolet light can be extracted from the laser plasma to the outside of the gas cell through an ultraviolet-light window.

[0012]

As the inert gas to be packed in the gas cell, at least one type of noble gas, including krypton (Kr), xenon (Xe) and argon (Ar), or a gas mixture including, as a major component thereof, at least one of such noble gases, can be used. Krypton (Kr) is more preferred as the inert gas. The pressure of the packed gas is usually about 0.01 to 1 MPa and more preferably about 0.05 to 0.5 MPa.

[0013]

If gases having absorbance in the ultraviolet range, particularly, in the vacuum ultraviolet range, remain in the gas cell (examples of such gases include oxygen, carbon dioxide and carbon monoxide, and these gases will hereinafter be referred to as "impurity gases"), impurity gases absorb part of the generated ultraviolet light having a lower wavelength and may affect the performance of the light source. Accordingly, it is preferable to exhaust air from the gas cell as required before packing the inert gas, so as to achieve a high degree of vacuum within the gas cell and to thereby increase the purity of the inert gas packed in the gas cell. Such exhausting of air can be performed by a known means, such as a turbo-molecular pump. The purity of the inert gas in the gas cell is preferably 99.9% or more, more preferably 99.99% or more and even more preferably 99.999% or more. Argon or helium will not substantially affect the

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